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Filing Date: May 9, 2005
Title: FINGERPRINTING MULTIMEDIA CONTENTS

REMARKS

This communication responds to the Final Office Action mailed on May 13, 2009. No claims are amended, no claims are canceled, and no claims are added in this correspondence. As a result, claims 1-15 are now pending in this Application.

§ *103 Rejection of the Claims*

Claims 1-15 were rejected under 35 U.S.C. § 103(a) as being obvious over Chen et al. ("Symmetric phase-only matched filtering of Fourier-Mellin transforms for image registration and recognition"; hereinafter "Chen") in view of Sharma et al. (U.S. Patent Application Publication No. 2004/0128512; hereinafter "Sharma") and further in view of Pareira et al. ("Template-based recovery of Fourier-based watermarks using log polar and log-log maps"; hereinafter "Pareira"). However, since a *prima facie* case of obviousness has not been properly established by the Office, the Applicant respectfully traverses the rejection of these claims.

1)   **The Applicable Law**

The Examiner has the burden under 35 U.S.C. § 103 to establish a *prima facie* case of obviousness. *In re Fine* , 837 F.2d 1071, 1074, 5 U.S.P.Q.2d (BNA) 1596, 1598 (Fed. Cir. 1988). As discussed in KSR International Co. v. Teleflex Inc. et al. (U.S. 2007), the determination of obviousness under 35 U.S.C. § 103 is a legal conclusion based on factual evidence. *See Princeton Biochemicals, Inc. v. Beckman Coulter, Inc.*, 7, 1336-37 (Fed. Cir. 2005). The legal conclusion, that a claim is obvious within § 103(a), depends on at least four underlying factual issues set forth in *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17 (1966): (1) the scope and content of the prior art; (2) differences between the prior art and the claims at issue; (3) the level of ordinary skill in the pertinent art; and (4) evaluation of any relevant secondary considerations.

The *KSR* Court further held that "rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." (*See In re Kahn*, 441 F.

3d 977, 988 (CA Fed. 2006) cited with approval in *KSR Int'l v. Teleflex Inc.*, 127 S. Ct. 1727,

1740-41 (2007)).

Therefore, the Examiner must, as one of the inquiries pertinent to any obviousness

inquiry under 35 U.S.C. §103, recognize and consider not only the similarities but also the

critical differences between the claimed invention and the prior art. (*In re Bond*, *910* F.2d

831,834, 15 USPQ2d 1566, 1568 (Fed. Cir. 1990), *reh'g denied*, 1990 U.S. App. LEXIS 19971

(Fed. Cir.1990)). Critical differences in the prior art must be recognized (when attempting to

combine references). (*In re Bond*, 910 F.2d 831,834, 15 USPQ2d 1566, 1568 (Fed. Cir. 1990),

reh'g denied, 1990 U.S. App. LEXIS 19971 (Fed. Cir.1990).)

Moreover, the fact that a reference teaches away from a claimed invention is highly

probative that the reference would not have rendered the claimed invention obvious to one of

ordinary skill in the art. (*Stranco Inc. v. Atlantes Chemical Systems, Inc.,* 15 USPQ2d 1704,

1713 (Tex. 1990).) When the prior art teaches away from combining certain known elements,

discovery of a successful means of combining them is more likely to be nonobvious. (*Id.* at 4

citing *United States v. Adams,* 383 U.S. 39, 51-51 (1966).)

"If the proposed modification or combination of the prior art would change the principle

of operation of the prior art invention being modified, then the teachings of the references are not

sufficient to render the claims prima facie obvious." (*In re Ratti*, 270 F.2d 810, 123 USPQ 349

(CCPA 1959). The CCPA has also noted that "[t]he court must be ever alert not to read

obviousness into an invention on the basis of the applicant's own statements; that is, we must

view the prior art without reading into that art appellant's teachings." *In re Sponnoble,* 160

USPQ 237, 243 (CCPA 1969). These principles have not been changed by the ruling in *KSR*.

2)   *Application of § 103 to the Rejected Claims*

First, it is respectfully noted that Sharma is non-analogous art, being directed to

embedding coded data in a medium, or watermarking processes. Sharma teaches that:

> "Digital watermarking is a process for modifying media content to embed a
> machine-readable code into the data content. The data may be modified such that
> the embedded code is imperceptible or nearly imperceptible to the user, yet may
> be detected through an automated detection process." Sharma, paragraphs [0002]
> – [0003].

As a matter of contrast, the claims of the Application are directed to methods and apparatus that operate to extract fingerprints from native aspects of an audio signal. Claim 1 recites "subjecting the extracted set of features [from the audio signal] to a Fourier-Mellin transform to compensate for speed changes in the audio signal; and converting the transformed set of features into a sequence constituting the fingerprint." The Application notes that:

> "Fingerprints, in the literature sometimes referred to as hashes or signatures, are binary sequences extracted from multimedia contents, which can be used to identify said contents. Unlike cryptographic hashes of data files (which change as soon as a single bit of the data file changes), fingerprints of multimedia contents ... are to a certain extent invariant to processing ... This is generally achieved by extracting the fingerprint from perceptually essential features of the contents."
> Application, pg. 1, lines 6-12.

In other words, watermarking creates code that is "imperceptible or nearly imperceptible to the user" when embedded in another medium, whereas a fingerprint is extracted from "perceptually essential features of the contents". Thus, the detection of digital watermarking taught by Sharma, and the conversion of transformed, extracted features into fingerprints described by the claims, are clearly two different processes.

"To Rely on a Reference Under 35 U.S.C. 103, it Must be Analogous Prior Art". M.P.E.P. §2141.01(a). "A reference is reasonably pertinent if, even though it may be in a different field from that of the inventor's endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to an inventor's attention in considering his problem." *In re Clay*, 966 F.2d 656, 659 (Fed. Cir. 1992)." *KSR Int'l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727, 1742 (2007). While "...Patent Office classification of references and the cross-references in the official search notes of the class definitions are some evidence of "nonanalogy" or "analogy" respectively, the court has found "the similarities and differences in structure and function of the inventions to carry far greater weight." M.P.E.P. §2141.01(a), citing *In re Ellis*, 476 F.2d 1370, 1372, 177 USPQ 526, 527 (CCPA 1973).

Watermarking operates to embed selected foreign information within a medium, whereas fingerprinting extracts native information from the medium to identify content within the medium. The information in a watermark can exist independently from the medium which it inhabits; the information that makes up a fingerprint can not. One of ordinary skill in the art

would not have logically referred to processes in Sharma that operate to embed a foreign watermarking code in visual information as a way of solving the problem of extracting fingerprints that tolerate speed changes in audio material. That is, Sharma, which uses a Fourier-Mellin transform to perform remapping of transformed image blocks as part of a watermark detection process, is non-analogous to the claimed embodiments, which are directed to a feature extraction, digital fingerprint creation process. *See* Sharma, paragraphs [0113]-[0114].

Second, while the Office asserts that "Sharma et al. teaches a method of extracting a fingerprint ... comprising the steps of ... extracting a set of robust features from an audio signal ... [and] subjecting the extracted set of features to a Fourier-Mellin transform to compensate for speed changes in the audio signal ...", the Applicant was unable to find anything within the bounds of Sharma or Chen that teaches how one should apply the Fourier-Mellin transform to an audio signal – so that reliable results would be obtained in the face of speed changes, and so the problems due to differences in scaling and rotation, encountered when this technique is used with images, might be avoided. *See* Chen, pg. 1157, Col. 1.

Third, the Office admits that "Sharma fails to specifically teach the feature sequence constitutes the fingerprint ..." and proposes to combine Sharma and Chen to remedy this deficiency. However, this proposition overlooks the specific language of Chen, which teaches away from the combination. Indeed, Chen's research results directly contradict the motivation set forth by the Office for combining the references (i.e., "... it would have been obvious ... to include the magnitude algorithm in Fourier transform of Chen et al in order to overcome the sampling problem and maximizing the number of points matched between the template and the image.)"

For example, Chen discovered that even when the Fourier-Mellin transform is improved by using FMI-SPOMF (Fourier-Mellin Invariant – Symmetric Phase Only Matched Filtering), the results are poor in applications that use image data. Thus, even when FMI-SPOMG was applied to matching fingerprint images to improve the basic Fourier-Mellin process, Chen noted that the results were "inferior to those observed with the other applications ...". *See* Chen, pg. 1165, Col. 2.

Indeed, only 54.97 % PD (percent discrimination) was achieved when identical fingerprint images were compared using the improved process. *See* Chen, pg. 1161, Col. 1.

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Since the PD is a relative measure of similarity between images, this means that when identical fingerprint images were compared, the FMI-SPOMF technique indicated 55% similarity. Even more telling is the fact that comparisons of dissimilar images provided up to 41.78 % PD. *See Id.* In summary, even when an improved form of the Fourier-Mellin transform was applied by Chen, identical images were designated as being only about 55% "similar", whereas dissimilar images in some cases were designated as about 42% similar. These "inferior" results, as stated by Chen, would not lead one of ordinary skill in the art to use the improved version of the Fourier-Mellin transform on image data, let alone the regular version.

In fact, Chen urges even more strongly, with results supported by his own experimentation, that regular Fourier-Mellin transforms do not provide reliable results for image processing:

> "... the cross-correlation of the Fourier-Mellin transforms generally yields a very broad maximum, and this technique is therefore **unreliable** both for the identification and localization of an object in an image. ... the usual cross-correlation method, which we applied in comparison, **did not yield any correct matching** [with respect to visual fingerprint images]." *See* Chen, pg. 1157, col. 1 and pg. 1165, col. 2. (emphasis added)

Thus, the statement by the Office with respect to Sharma as to the viability of using a regular Fourier-Mellin transform to identify fingerprints in audio applications is not supported by evidence in the record. Therefore, it is improper to combine Sharma with Chen to remedy the deficiency of Sharma, namely, a failure to describe or suggest transforming audio signal features to extract an audio fingerprint. The addition of Pereira does nothing to remedy this deficiency.

Since the Office continues to promote the combination of Sharma and Chen, the Applicant respectfully requests evidence to support the assertions made by the Office, or an affidavit of personal knowledge by the Examiner, pursuant to M.P.E.P. § 2144.03, in the next official communication. Otherwise, since there is no "specific, objective evidence of record for a finding of a suggestion or motivation to combine reference teachings and ... reasoning by which the evidence is deemed to support such a finding," the Applicant respectfully requests withdrawal of the rejection of these claims on this basis.

Fourth, as noted in a prior response, the Applicant respectfully submits that the combination of limitations in independent claims 1 and 8 yield an unpredictable an unexpected result, namely, compensating for speed changes in an audio signal to provide a speed invariant fingerprint. Since the result of the claimed features is not predictable, and because Chen teaches away from the use of the Fourier-Mellin transform with respect to image recognition, one of ordinary skill in the art would have no reasonable expectation of success when considering the combination of Sharma and Chen.

To summarize: (1) Sharma constitutes non-analogous art, (2) none of the references teach how the Fourier-Mellin transform should be applied to an audio signal in the face of speed changes, (3) Chen strongly teaches away from combination with Sharma, and (4) the claimed embodiments provide unexpected results.

Therefore, independent claims 1 and 8, reciting the transformation of extracted perceptual features from an audio signal to provide a fingerprint that compensates for speed changes in the audio signal, are nonobvious. In addition, any claim depending from a nonobvious independent claim is also nonobvious. *See* M.P.E.P. § 2143.03. Therefore, claims 2-7 and 9-15 should also be in condition for allowance, and the Applicant respectfully requests reconsideration and withdrawal of the rejection of claims 1-15 under 35 U.S.C. § 103(a).

CONCLUSION

The Applicant respectfully submits that the claims are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone the undersigned representative at (210) 308-5677 to facilitate prosecution of this Application. If necessary, please charge any additional fees or deficiencies, or credit any overpayments to Deposit Account No. 19-0743.

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Respectfully submitted,

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being filed using the
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Alexandria, VA 22313-1450 on this __13__ day of July, 2009.

  John D. Gustav-Wrathall   / _John D. Gustav-Wrathall_ /

Name   Signature